[X�̆MTEX-Tips 130208a-pdf]
Disaccharides—Sugars

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Question:

How can I draw sugars by using XᴙMTEX?

Answer:

The commands `\furanose` and `\pyranose` are supported by XᴙMTEX to draw monosaccharides. They are combined by using (yl) functions. The following code is effective in the plain mode of XᴙMTEX, the PostScript mode, and the PDF mode.

```
%130208a-pdfTest.tex
\documentclass{article}
%\usepackage{xymtex}%plain mode
%\usepackage{xymtexps}% PostScript mode ... followed by dvips(k)
\usepackage{xymtexpdf}% PDF mode ... followed by dvipdfmx
\begin{document}

\utrigonal{0==O;2==%
\furanose{4==(yl);1Sa==CH$_{2}$OH;2Sb==\lmoiety{HO};%
2Sa==H;3Sb==H;3Sa==OH;4Sb==HOC\rlap{H$_{2}$}};%
3==\pyranose{1==(yl);2Sa==OH;3Sb==OH;4Sa==HO;5Sb==CH$_{2}$OH}}

\end{document}
```
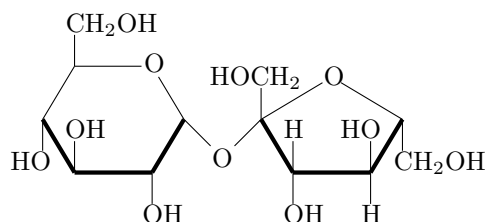
The present XyMTeX-tip deals with the PDF mode. The code named "130208a-pdfTest.tex" is executed by LATEX as follows:

```
c:\> latex 130208a-pdfTest
```

The resulting .dvi file is converted into the corresponding .pdf file:

```
c:\> dvipdfmx 130208a-pdfTest
```

Thereby, we obtain a .pdf file ("130208a-pdfTest.pdf"), which contains the following structural formula of a disaccharide.
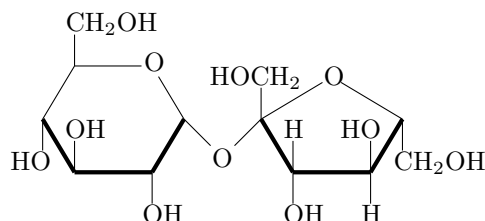

The .pdf file is browsed by the Adobe Reader.

Further Techniques

The same formula can be drawn by using lower-level commands `\fivesugarh` and `\sixsugarh`, which are capable of specifying the position of an oxygen atom in each sugar skeleton.

```
\utrigonal{0==O;2==%
\fivesugarh{5==O}{4==(yl);1Sa==CH$_{2}$OH;2Sb==\lmoiety{HO};%
2Sa==H;3Sb==H;3Sa==OH;4Sb==HOC\rlap{H$_{2}$}};%
3==\sixsugarh{6==O}{1==(yl);2Sa==OH;3Sb==OH;4Sa==HO;5Sb==CH$_{2}$OH}}
```

Inner wedged bonds can be drawn by using the `\WedgeAsSubst` command. The following code uses the `\draw` command of the pgf package.

```
\utrigonal{0==O;2==%
\fivesugarh{5==O;1s==\WedgeAsSubst(0,0)(-3,-5){120};%
4s==\WedgeAsSubst(0,0)(3,-5){120};%
3s==\tikznodimension{\draw[line width=2.9pt]%
(-17\unitlength,0) -- (307\unitlength,0);}%
}{4==(yl);1Sa==CH$_{2}$OH;2Sb==\lmoiety{HO};2Sa==H;%
3Sb==H;3Sa==OH;4Sb==HOC\rlap{H$_{2}$}}[abc];%
3==\sixsugarh{6==O;1s==\WedgeAsSubst(0,0)(-3,-5){120};%
4s==\WedgeAsSubst(0,0)(3,-5){120};%
3s==\tikznodimension{\draw[line width=2.9pt]%
(-17\unitlength,0) -- (307\unitlength,0);}%
}{1==(yl);2Sa==OH;3Sb==OH;4Sa==HO;5Sb==CH$_{2}$OH}[abc]}
```
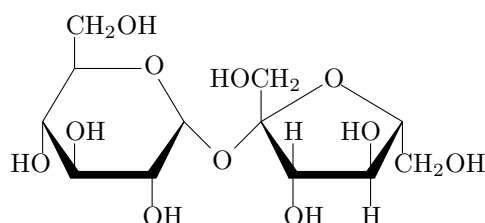
In place of the `\draw` command of the pgf package, a more general command `\PutBondLine` can be used in the PDF mode as well as in the PostScript mode. Thus, the following code is processed by the PDF mode of XΥMTEX.

```
\utrigonal{0==O;2==%
\fivesugarh{5==O;1s==\WedgeAsSubst(0,0)(-3,-5){120};%
4s==\WedgeAsSubst(0,0)(3,-5){120};%
3s==\PutBondLine(-15,0)(305,0){3.2pt}%
}{4==(yl);1Sa==CH$_{2}$OH;2Sb==\lmoiety{HO};2Sa==H;%
3Sb==H;3Sa==OH;4Sb==HOC\rlap{H$_{2}$}}[abc];%
3==\sixsugarh{6==O;1s==\WedgeAsSubst(0,0)(-3,-5){120};%
4s==\WedgeAsSubst(0,0)(3,-5){120};%
3s==\PutBondLine(-15,0)(305,0){3.2pt}%
}{1==(yl);2Sa==OH;3Sb==OH;4Sa==HO;5Sb==CH$_{2}$OH}[abc]}
```

Thereby, we obtain the same formula of the sugar as depicted above:

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